A bidirectional telemetry method for long-term glucose monitoring using fast scan cyclic voltammetry

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Introduction

Glucose level can be monitored using fast scan cyclic voltammetry (FSCV) [1][2]. The FSCV is known to have better chemical resolution than conventional sensors. [2] The FSCV can be implemented wirelessly [3]. However, the latter system is based on Bluetooth unit which requires a battery in the internal unit. We propose a method for wireless transmission of FSCV where the internal unit has no battery thus is more suitable for continuous glucose monitoring.

Methods

The device can transmit triangular voltage waveforms and receive currents recorded by implanted electrode. The device consists of an external and an internal unit; the external module contains control circuits and a battery while the internal unit has a receiver-voltage waveform generator circuit and a current sensing circuit. The internal unit is powered by the RF transmitted power from outside. We use single pair of transcutaneous coil link for forward power transmission and bidirectional data transmission.

Results

The designed system is capable of delivering a triangular voltage waveform with voltages ranging from -2.5 to +2.5 V and with scan rates up to 200 V/sec. It can record the currents up to 500 nA. Our maximum data rate is 500 Kbps which enables a current resolution of 2 nA at 50kS/s sampling rate. The system operates in real time without internal battery.

Conclusions

A novel minimally invasive glucose sensing system made up of implantable FSCV circuit and wireless coil telemetry unit is proposed. The system enables frequent and long-term monitoring of glucose level.

References

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